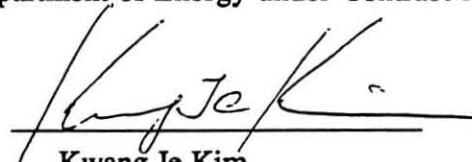


Requirements and Accelerator Design of a Highly-Stable Infrared Free Electron Laser at LBL*, K-J. Kim, M. Berz, S. Chattopadhyay, C. Kim, A. Kung, M. Xie, Lawrence Berkeley Laboratory, 1 Cyclotron Rd., Berkeley, CA., 94720, J. Edighoffer, Pulse Sciences Inc., 600 McCormick St., San Leandro, CA 94577, and W. Stein, Industrial Radiation, Inc., 124 Monte Rey Dr. N., Los Alamos, NM 87544--An infrared free electron laser (IRFEL) is being designed for the Combustion Dynamics Facility (CDF) at LBL. The FEL is based on a 50 MeV RF linac operating in synchronization to the Advanced Light Source (ALS), and will produce intense (100 μ J per 10 ps micropulse), narrow bandwidth (0.1%) radiation between 3 μ m and 50 μ m. In the design, we pay particular attention to the FEL stability issues and require that the fluctuations in the electron beam energy and in the timing be less than 0.05% and 0.1 ps respectively. We discuss various sources of fluctuations in the gun, the bunchers and the accelerator sections, as well as the feedback and feedforward schemes to reduce these fluctuations. The accelerator structure is chosen to be of the side coupled, standing wave type for easier control. The beam transport is made isochronous to avoid the coupling between the energy and the timing fluctuations.

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Submitted by: (signature)

Name (typewritten):


Kwang Je Kim

Full address and phone number

Mail Stop 47-112
Lawrence Berkeley Laboratory
Berkeley, CA 94720 USA
(415)486-7224

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